

ACC NR: AR6035100

SOURCE CODE: UR/0137/66/000/008/A012/A012

AUTHOR: Ivoninskiy, V. A.; Regel', A. R.

TITLE: Thermoelectric properties of the Bi_2Te_3 - Bi_2Se_3 system in the liquid state

SOURCE: Ref. zh. Metallurgiya, Abs. 8A79

REF SOURCE: Uch. zap. Leningr. gos. ped. in-ta im. A. I. Gertsena, no. 265, 1965, 183-192

TOPIC TAGS: thermoelectric property, electric conductivity, *bismuth compound,*
thermoelectromotive force, bismuth telluride, bismuth selenide, *telluride,*
selenide

ABSTRACT: The thermoelectric properties of the Bi_2Te_3 - Bi_2Se_3 system in the liquid state have been investigated at temperatures ranging from room level to $800-900^\circ$. Bi (99.97 %) and thrice-distilled Te and Se served as the initial material for producing these alloys. The selenium used was of the grade intended for use in selenium rectifiers. Measurements of both the electrical conductivity σ ($\text{ohm}^{-1} \cdot \text{cm}^{-1}$) and the thermoelectromotive force α (millivolt/deg) were conducted in specially designed vacuum quartz ampulae with welded-in tungsten

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UDC: 669-154:541.133

ACC NR:

AR6035100

electrodes 0.5 mm in diameter. At the point of contact, the electrodes were shielded with graphite tips. Conventional d-c potentiometers were used. The impedance was measured in two directions of the current through the sample. Altogether, 25 samples of various composition were tested. An increase in σ was observed during melting in samples with higher Bi_2Te_3 content. A maximum value of σ was noted at 20 at % of Bi_2Te_3 . The abrupt jump of σ during melting changes from 1.25 for Bi_2Se_3 to 5.3 for 20 at % of Bi_2Se_3 . In certain temperature ranges beyond the melting point, the σ value increases in all samples with an increase in temperature. This is explained by the homopolar-bond dissociation process of the homopolar bonds. By further heating the alloys rich in Bi_2Te_3 above the melting point, a change in their temperature coefficient occurs, including a change in sign. Alloys rich in Bi_2Te_3 generate positive thermoelectromotive force α in the impurity conductivity band. At a temperature of $T > 300^\circ\text{C}$ $\alpha < 0$ in all alloys, and increases as the temperature increases. It drops sharply at the melting point, and afterwards with increasing temperature it changes its sign to positive in all alloys concerned. Bibliography contains 16 titles. There are 3 figures and 3 tables. [Translation of abstract] [KP]

SUB CODE: 11, 20/

Card 2/2

ACC NR: AP7005880

SOURCE CODE: UR/0181/66/003/012/3631/3633

AUTHOR: Andreyev, A. A.; Regel', A. R.

ORG: Institute of Semiconductors, AN SSSR, Leningrad (Institut poluprovodnikov AN SSSR)

TITLE: Hall coefficient in the liquid metals Hg, Ga, In, and Sn and in the alloys In₂Bi and Hg-Sn

SOURCE: Fizika tverdogo tela, v. 8, no. 12, 1966, 3631-3633

TOPIC TAGS: Hall effect, liquid metal, indium alloy, mercury alloy, tin containing alloy, bismuth containing alloy, free electron, chemical valence

ABSTRACT: This is a continuation of earlier work (FTT v. 7, 2567, 1965), where deviations from the theory of free electrons were observed for Hg-Tl alloys, in the value of the Hall coefficient, from that predicted in the model of free electron theory. In the present paper the authors present the results of measurements of the absolute values of the Hall coefficient for a number of liquid metals and alloys, carried out with accuracy not worse than 5%. To ensure high accuracy, the inhomogeneity of the magnetic field along the sample was not higher than 0.3% at 1.8 kG. The inhomogeneity in the current density was not higher than 2%. The Hall signal was measured by a method using an alternating current and an alternating magnetic field. A table of the Hall coefficients obtained in the measurements and of those obtained from the theory of free electrons is presented and it is shown that for Hg,

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ACC NR: AP7005830

Ga, In, and Sn the theory of free electrons fits the experimental data quite well. Deviations are observed for In_2Bi and Hg-Sn, especially in the latter. The results are interpreted from the same point of view as was proposed in an earlier paper, namely that the deviations from the theory of free electrons in the alloys are due to variable valence of the Sn atoms in the melt. Orig. art. has: 1 table.

SUB CODE: 20/ SUBM DATE: 30Jun66/ ORIG REF: 002/ OTH REF: 005

Card 2/2

L 00749-66 EWT(m)/EPF(c)/EWP(j)/T/ETC(m) WW/RM

ACCESSION NR: AP5020966

UR/0190/65/007/008/1339/1343

AUTHOR: Zhurkov, S. N.; Regel', V. R.; Sanfirova, T. P.

TITLE: Effect of active additives on the time-temperature dependence of polymer strength

SOURCE: Vysokomolekulyarnyye soyedineniya, v. 7, no. 8, 1965, 1339-1343

TOPIC TAGS: polymer, depolymerization, pole shift, thermal decomposition, radical reaction, stabilizer additive

ABSTRACT: The authors previously proposed that the pole shift effect in polymers is caused by secondary radical reactions which affect the degradation process rate. The effect of the addition of active additives to polymethylmethacrylate on the pole shift in $\lg T - 1/T$ coordinates was studied. Radical reaction initiators (benzoyl peroxide) increased the pole shift, that is, shifted the pole to the right away from the ordinate axis. Radical reaction inhibitors (hydroquinone, diphenylmethacrylamide, 2,2'-methylene-bis-4-methyl-6-tert. butylphenol, 2-(2-hydroxy-5-methylphenyl)benzocresol) decreased the effect, shifting the pole

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ACCESSION NR: AP5020966

to the left nearer its normal position on the ordinate axis. The pole shift also depended on concentration of the additive; the shift decreased when more than the optimum amount of stabilizer was added. It was indicated these results serve as additional argument in favor of kinetic concepts of the nature of polymer degradation, and of the intimate relationship between degradation and thermal decomposition processes. "Diphenylmethacrylamide stabilizer was kindly supplied by T. A. Sokolov, and the other stabilizers and antioxidant by Ye. N. Matveyev." 44, 55
Orig. art. has: 4 figures

ASSOCIATION: Fiziko-tekhnicheskiy institut im. A. F. Ioffe (Physicotechnological Institute) 44, 55

SUBMITTED: 04Sep64

ENCL: 00

SUB CODE: MT, GC

NR REF SOV: 007

OTHER: 000

DP
Card 2/2

L 1356-66 EWT(d)/EWT(m)/EWP(w)/EWP(t)/EWP(b) IJP(c) JB/EM
ACCESSION NR: AP5021939 UR/0126/65/020/002/0288/0292
539.292; 548.0:539

45
35
B

AUTHOR: Leksovskiy, A. M.; Regel', V. R.

TITLE: Temperature-time dependence of the strength of aluminum under static and cyclic loads ^{44, 55} ₂₆ ^{44, 55, 27}

SOURCE: Fizika metallov i metallovedeniye, v. 20, no. 2, 1965, 288-292

TOPIC TAGS: temperature dependence, time dependence, aluminum strength, static load, cyclic load, aluminum life, Zhurkov formula

ABSTRACT: The present work is a continuation of a previous investigation (Regel', V. R., Leksovskiy, A. M. FTT, 1962, 4, 949), with the difference that it presents further experimental findings on the comparative endurance under static and cyclic loads, with the object of elucidating the reasons for the observed divergence between τ_{stat} and τ_{cycl} . To this end, the cyclic and static lives of aluminum were observed not only at room temperature, as in the previous investigation, in which thus no allowance was made for the relaxation processes, but also at other test temperatures (250, 100, 18, and -50°C), and in the presence of

Card 1/3

L-1356-66

ACCESSION NR: AP5021939

two loading frequencies (24 and 0.8 cps). Findings: as the temperature increases, the discrepancy between τ_{stat} and τ_{cycl} gradually decreases: at 18°C and particularly at -50°C this discrepancy is very marked, whereas at 250°C it becomes insignificant even in the presence of a large number of cycles prior to fracture of the specimens of polycrystalline ultrafine aluminum (99.9%). This qualitatively confirms the theory that relaxation processes play a major role in the discrepancy between τ_{stat} and τ_{cycl} . Another highly important fact is that at sufficiently high temperatures, when the rate of relaxation processes is high, the frequency effect and the discrepancy between static and cyclic lives disappear. It is thus concluded that -- at least under the limited conditions of experiment (in the high-temperature range) -- whatever the loading regime, the process of fracture is traceable to one and the same thermal activation mechanism, the nature of which is reflected by Zhurkov's equation (ZhTF, 1958, 23, 1677, and elsewhere):

$$\tau = \tau_0 e^{\frac{U_0 - \gamma \sigma}{kT}}$$

(1)

Card 2/3

E 1356-66

ACCESSION NR: AP5021939

The discrepancy between τ_{cycl} and τ_{stat} that is observed at low temperatures may be attributed not to the non-observance of the principle of superposition of disturbances but to the difference between the static and cyclic coefficients τ_0 , u_0 , γ , of τ . Primarily, however, it should be attributed to the change in the structure-sensitive coefficient γ in Zhurkov's formula, as well as to the local heating of the material in the course of its multiple deformation. "The authors are indebted to S. N. Zhurkov for his interest in this project and participation in discussing the findings and to K. I. Ivanov for performing the measurements." Orig. art. has: 1 figure, 4 formulas. ^{44,55}

ASSOCIATION: Fizikotekhnicheskiy institut im. A. F. Ioffe AN SSSR (Physicotechnical Institute AN SSSR) ^{44,55}

SUBMITTED: 28Jun64

ENCL: 00

SUB CODE: AS, MM

NO REF SOV: 010

OTHER: 000

Fatigue ^{dg}

Card 3/3

VERSHININA, M.P.; RECEL', V.R.; CHERNYY, N.N.

Effect of ultraviolet radiation on the strength of polymers. Vysokom.
soed. 6 no.8:1450-1457 Ag '64. (MIRA 17:10)

1. Fiziko-tekhnicheskii institut imeni A.F.Ioffe.

Regel, V. R.

Index
Aeronautics
May 1954
Plastics,
Rubber

314/105

D. Math
678 :539.219.2
Mechanism of Brittle Failure
of Plastics

Zh. tekhn. Fiz.
21, (3), 287-303
1951

U.S.S.R.

V. R. Regel

A ~~microscopic~~ study of the crazing of polymethyl a methacrylate surface in which the rate of formation and of growth of cracks visible under the microscope is measured. The mechanism of formation and growth of these cracks is discussed. The phenomena can be satisfactorily accounted for in terms of the statistical theory of 'overloaded' cracks and of the brittle failure of materials under stress. (Bibl. 9)

RE 2-5 MR.

The resistance of some plastics to brittle rupture. V. R. Regel and Yu. N. Nedoshvin. Zhur. Tekh. Fiz. 23, 1883-4 (1953); cf. C.A. 47, 8019d.—Brittleness can be measured by detg. the time delay, τ , between the application of a load, δ (kg./sq. mm.), and the first observation of visible cracks. Since τ might be long it is better to det. the load δ_c necessary to produce cracks in $1/2$ hr. The value of δ_c in com. samples is generally lower than in annealed pieces; quenched samples having "useful" compression strains have still higher values of δ_c . Tests were made on polystyrene, polyvinyl chloride plasticized with dioctylphthalate, and polymethylmethacrylate nonplasticized and plasticized with various amts. of dibutylphthalate. The value of δ_c decreases with increasing temp. and with increasing plasticizer content. Polymethylmethacrylate is the most resistant material. Cracks were observed not only on the surface but also in the vol. of the material. The results are discussed from the viewpoint of relaxation processes and elastic stresses. S. Faksver

JP 22

Regel V.R.

U S S R .

A Rigid Optical Dynamometer. V. R. Regel' and N. M. Melankholin. (Zhurnal Tekhnicheskoy Fiziki, 1964, 24, (3), 454-459); (In Russian). A description of a rigid dynamometer suitable for measurements of relaxation of stresses in compressed specimens is given. V. R.

gyp Jan

REGAL', V. R.

USSR/Physics - Relaxation, Measuring Instruments

FD 367

Card 1/1

Author : Regal', V. R. and Melankholin, N. M.

Title : Rigid optical dynamometer

Periodical : Zhur. tekhn. fiz. 24, 454-459, Mar 1954

Abstract : Describes dynamometer for measuring stress relaxation in compressed specimens. Compressing force is measured by determination of double refraction in a crystal-measurer which is made of a single crystal of TlI-TlBr solid solution. Design is based on sufficiently high rigidity of crystal-measurer, so its deformation is considerably lower than that of test specimen. Instrument, being equipped with special optical system, is used in combination with microscope and serves for plotting relaxation characteristics of various materials. One USSR reference since 1953. Illustrations.

Institution :

Submitted : October 16, 1953

REGEL', V. R.

USSR/ Physics - Crystallography

Card 1/1 Pub. 86 - 13/33

Authors : Regel', V. R.

Title : Model of the structure of a real crystal

Periodical : Priroda 43/11, 95-98, Nov 1954

Abstract : Roentgenographic and electronographic methods of studying the lattices of crystals are presented. Surfaces are taken as specimens that have been subjected to polishing or etching. Through an analysis of these a concept is formed of the structure of monocrystals and polycrystalline substances, as well as of the structure of amorphous substances and liquids. From these concepts models are made, as shown in the illustrations. Five references: 4-English and 1-USSR (1942-1949). Illustrations.

Institution : ... Inst Crystallography, A S USSR

Submitted : ...

REGEL', V.R.

Strain curves of single crystals of TlBr+TlJ. Trudy Inst.krist.
no.11:152-157 '55. (MLRA 9:6)
(Dislocations in crystals) (Thallium)

Regel, V.R.
USSR/Optics - Physical Optics.

K-5

Abs Jour : Referat Zhur - Fizika, No 5, 1957, 12903

Author : Dubov, G.A., Regel', V.R.

Inst : -

Title : Photoelectronoptical Dynamometer.

Orig Pub : Zh. tekhn. fiziki, 1955, 25, No 14, 2542-2544

Abstract : The operating principle of the dynamometer is based on the use of the law of photoelasticity and on the measurement of double refraction by photoelectric methods. The dynamometer can be employed in machines for mechanical tests as an instrument for the measurement of force. It is convenient to use it to obtain curves of compression and relaxation of stress. Among the shortcomings of the instrument is the absence of a linear connection between the photoelectric current and the change in force, and the need for frequent recalibration. The accuracy of the measurements is characterized by an error of 0.06 kg at a load of 60 --
70 kg.

Card 1/1

USSR/Physics - Crystals disruption

FD-3252

Card 1/1 Pub. 146 - 11/44

Author : Melankholin, N. M.; Regel', V. R.

Title : Experience gained in an investigation of the process of disruption of NaCl crystals

Periodical : Zhur. eksp. i teor. fiz., 29, No 6(12), Dec 1955, 817-821

Abstract : An investigation, by the method of cinematography under polarized light, of the process governing the development of fissures during stretching of specimens of NaCl single-crystals. It is shown that the fissures are propagated in jump-like fashion. The development of fissures is prevented by the shear bands, which must be intersected by the fissures. The authors assume that the prevention of the propagation of fissures is caused by those regions of the shear bands in which compressing stresses exist. The regions of the shear bands with tensile stresses evidently must not prevent the development of fissures. The authors thank Professor M. V. Klassen-Neklyudova for her advice. Twelve references: e.g. M. V. Klassen-Neklyudova, *ibid.*, 6, 584, 1936.

Institution : Institute of Crystallography, Academy of Sciences USSR

Submitted : June 14, 1954

English Trans in Soviet Physics JETP (New York), Vol.2, No. 4, 696-702 (July 1956)

Regel, V.R.

✓ Experiments for the study of gliding phenomena in sodium chloride crystals. N. M. Melankholin and V. R. Regel. *Trudy Inst. Krist., Akad. Nauk S.S.S.R.* 1956, No. 12, 148-57. —The previous micro-cinematographic results of Stepanov and Mil'kamanovich (cf. *C.A.* 45: 9975ag, 9978c) are confirmed by improved exptl. methods in polarized light between crossed Nicols. The problem of holding the crystal at high temps. was considered carefully. The relative local distribution of compressive and tensile strains in the crystal that induce the shear gliding translation phenomena are described in detail. Under a constantly increasing load there is also an extinction of the (110) translation lamellas, and the angles between the lamellas gradually change from 90° to higher (up to 97°) or lower amts., according to the loads applied to the crystal. The simplified explanation tentatively given is not satisfactory for some newly observed phenomena in translation expts. Thus, only one system of gliding planes may be intensely developed, the other systems of equal crystallographic rank are weak, or even suppressed, i.e. the shear gliding mechanism in this case, does not follow the cubic symmetry of the crystal.

W. Rittel

Am mt 2/11/56

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USSR/Crystals.

B-5

Abs Jour : Referat Zhur - Khimiya, No 6, 1957, 18311

Author : V.R. Regel', G.Ye. Tomilovskiy.

Inst : Institute of Crystallography of Academy of Sciences of USSR.

Title : Dependence of Flow Boundary of Monocrystals of TlBr + TlI on Deformation Speed and Temperature.

Orig Pub : Tr. In-ta kristallogr. AN SSSR, 1956, vyp.12, 158-171

Abstract : No abstract.

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USSR/ Physical Chemistry - Crystals

B-5

Abs Jour : Referat Zhur - Khimiya, No 4, 1957, 10921

Author : Regel' V.R.

Inst : Institute of Crystallography, Academy of Sciences USSR

Title : Simple Model of Two-Dimensional Crystal Lattice

Orig Pub : Tr. In-ta kristallogr. AN SSSR, 1956, No 12, 195-199

Abstract : Description of a model made from steel balls, and statement of its possible uses. See also RZhKhim, 1955, 48361

Card 1/1

REGEL', V.R.

Kinetics of cracking growth in the process of failure of
solids. Zhur.tekh.fiz.26 no.2:359-369 F '56. (MLRA 9:6)
(Plastics--Testing) (Photomicrography)

REGEL', V. R.

137-58-5-10568

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 5. p 241 (USSR)

AUTHOR: Regel', V. R.

TITLE: On the Relationship Between the Yield Point of Single Crystals and Temperature and Rate of Deformation (K voprosu o zavisi-mosti predela tekuchesti monokristallov ot temperatury i skorosti deformatsii)

PERIODICAL: V sb.: Issled. po zharoprochn. splavam. Vol 2. Moscow, AN SSSR. 1957, pp 275-280

ABSTRACT: Experiments were conducted with single crystals (C) of KRS-5 (TiBr+ TII) having a bodycentered cubic lattice and similar in mechanical properties to metallic C of the α -Fe type. The temperature and time dependence of the plasticity parameters of KRS-5 crystal are investigated by measurement, at various temperatures and rates of deformation (RD), of the elongation curves of specimens (S) oriented in the $[110]$ direction. The elongation curves are used to determine σ_s and the critical spalling stress. The measurements were made with S having a cylindrical working portion ~ 2.5 mm in diameter and and 12 mm long, on a Polanyi tensile testing machine at -180° .

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137-58-5-10568

On the Relationship Between (cont.)

20, 75, 100, 150, 200, and 250°C. At each temperature the elongation curves were measured at 9 or 10 different RD within the 1 to 10^{-5} mm/sec interval. It is established that the tensile curves change somewhat with change in the test conditions. Three types of curves may be distinguished. At high temperatures and slow RD, the curves attain saturation smoothly at comparatively low stress and then progress virtually parallel with the axis of abscissas. As the RD increases or the temperature diminishes, the shape of the curves undergoes a constant change, and clearly-defined maximums begin to appear. At yet higher RD or with further drop in temperature these maximums begin to disappear, and the stress past the point of inflection on the curve either remains constant or shows a smooth rise with increase in degree of deformation. Investigations of the dependence of σ_s upon temperature at various RD shows that in the low temperature interval σ_s is little dependent upon temperature, but that beyond that it begins to decline rather rapidly in a given temperature interval. The temperature interval in which the major drop in σ_s occurs shifts gradually toward the higher temperatures as RD rises. The conclusion is drawn that in the case under investigation the fundamental process of plastic deformation cannot be regarded as athermic. The temperature and time dependence, in the case of KRS-5 crystal, appears not only in the softening process, but also in processes determining the onset of clear slip in the C and also, it would seem, in hardening processes.

Card 2/2 1. Single crystals (Metallurgy)--deformation 2. Single crystals (Metallurgy)
--Temperature effects

~~Dubov, G.A. and Regel', V.R.~~ REGEL', V.R.

70-6-7/12

AUTHOR: Dubov, G.A. and Regel', V.R.

TITLE: On the Question of Testing Specimens of Small Dimensions by Compression and Relaxation of Stress. (K voprosu o metodike ispytaniy malogabaritnykh obraztsov na szhatiye i relaksatsiyu napryazheniy)

PERIODICAL: Kristallografiya, 1957, Vol.2, No.6, pp. 746 - 755 (USSR).

ABSTRACT: Specimens of single crystals of TlBr-TlI in various orientations and specimens of polymethylmethacrylate of small dimensions were tested on an extensometer of new design (Idem. a photo-electro-optical dynamometer, Zh.Tekh. Fiz., 25, No.14, 2542-4, 1955). The scatter of the results of the plastic, used to test the operation of the apparatus, was less than 1%. Scatter of the measurements for crystals can be attributed to non-uniformities in the specimens and to variable surface quality. For the plastic material under compression the elasticity did not depend on the ratio of specimen height h to diameter d for values of h/d between 1.5 and 6. The limit of flow s_T for monocrystals of TlBr-TlI oriented along $[110]$ did not depend on h/d for values between 1.5 and 4. For h/d less than 1.5 s_T rises with decreasing h/d . For $h/d=4$ and strains

70-6-7/12

On the Question of Testing Specimens of Small Dimensions by Compression and Relaxation of Stress.

of about 10% signs of longitudinal bending appear. Compression curves, automatically recorded, show clearly the stepwise nature of the process of deformation when slip takes place. The law of superposition of stresses is obeyed when testing under compression. The slip-formation limit also follows this law. The elastic limit of the polymethylmethacrylate obtained by compression was 1.5 times greater than that obtained by extension. The degree of relaxation in crystals of TlBr-TlI, oriented along $[110]$, measured in specimens with various values of h/d after they had undergone compressions of 15% grew linearly with increasing h/d for h/d greater than 1.5. Pure compression curves (up to 20% deformation) could be obtained with sufficient accuracy by direct measurement on specimens with h/d between 2 and 3 without using the normal method of extrapolating h/d to ∞ . There are 1 table, 5 figures and 8 Slavic references.

ASSOCIATION: Institute of Crystallography Ac.Sc.USSR.
(Institut Kristallografii AN SSSR)

SUBMITTED: March 1, 1957.

AVAILABLE: Library of Congress
Card 2/2

Regel', V.R.

70-6-8/12

AUTHOR: Regel', V.R. and Dubov, G.A.

TITLE: Experiments on the Investigation of the Kinetics of the Softening of Single Crystals of TlBr-TlJ. (Opyty po issledovaniyu kinetiki razuprocheniya monokristallov TlBr-Tl J)

PERIODICAL: Kristallografiya, 1957, Vol.2, No.6, pp. 756 - 759 (USSR).

ABSTRACT: To understand the processes of plasticity in crystals it is essential to accumulate data on the hardening and softening of crystals under deformation, these processes being regarded as competing. Measurements on the behaviour of single crystals of TlBr-TlJ, which are important for technology and research, have been made on an automatic photo-recording extensometer (described in Zh.Tekh.Fiz., 25, No.14, 2542, 1955). Single crystal specimens of cylindrical form, having height 5 mm and diameter 2.5 mm, were compressed along their axes of symmetry which had been made the [110] crystallographic axes. Before test, the crystals were annealed at 280 °C. The crystals were compressed at a uniform deformation rate of 2.5×10^{-4} /sec. The stress necessary increased linearly up to a point s_T at which the gradient changed abruptly, the crystal becoming softer, and

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Experiments on the Investigation of the Kinetics of the Softening
of Single Crystals of TlBr-TlJ. 70-6-8/12

the stress continued increasing linearly up to a point with stress s_0 . Compression was stopped when this stress (chosen to be double s_T , the limit of flow) was reached. The specimen was then unloaded and held at a temperature T for a time t and was then retested. The limit of flow reached in this case was s_1 (exceeding s_T). The degree of softening E was defined as $100X(s_1 - s_T)/(s_0 - s_T)$. E was plotted against t for a series of temperatures T from -70°C to $+150^\circ\text{C}$. These can be expressed in the form $E = E_0 e^{-t/\tau}$ where τ is the relaxation time of the process. The activation energy of the process can be calculated at 14 Kcal/mol. E is further plotted against t for two cases differing only in the presence or absence of external stress at room temperature. The rate of softening in the presence of stress is clearly less than when due purely to rest. This is contrary to several observations Card 2/3 by others. There are 3 figures and 7 Slavic references.

Experiments on the Investigation of the Kinetics of the Softening
of Single crystals of TlBr-TlJ. 70-6-8/12

ASSOCIATION: Institute of Crystallography, Ac.Sc. USSR.
(Institut Kristallografii AN SSSR)

SUBMITTED: March 1, 1957.

AVAILABLE: Library of Congress.

card 3/3

SOV/70-3-1-10/26

AUTHORS: Regel', V.R. and Govorkov, V.G.

TITLE: The Dependence of the Critical Splitting Stress of Single Crystals of Zinc on Temperature and Rate of Deformation (Zavisimost' kriticheskogo skalyvayushchego napryazheniya monokristallov tsinka ot temperatury i skorosti deformirovaniya)

PERIODICAL: Kristallografiya, 1958, Vol 3, Nr 1, pp 64 - 70 (USSR)

ABSTRACT: Studies have already been reported by Schmidt and Boas ("Plasticity of Crystals") on the behaviour of Cd at different temperatures and at different rates of deformation. In view of the similarity of its structure Zn has now been studied. Crystals of Zn were prepared from 99.98% Zn by the method of Obreimov and Shubnikov; they were withdrawn from the stove at a constant rate of 1.8 cm/h and had a length of about 150 mm. Each rod was cut into 3-4 specimens. The orientation was determined optically to 0.5° by identification of the 0001 (cleavage) plane. The angle between the normal to this plane and the axis of the rod was kept between 25° and 70° for the crystals used. Extension experiments were carried out

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SOV/70-3-1-10/26

The Dependence of the Critical Splitting Stress of Single Crystals of Zinc on Temperature and Rate of Deformation

on a Polyani-type machine and the temperature was stabilised to 1 °C. Experiments were made in the range 20 - 416 °C at extension speeds of 2.3×10^{-1} , 7.4×10^{-4} and 3.3×10^{-5} mm/sec. These gave the limit of flow s_t from which the critical splitting stress t_{cr} was obtained by $t_{cr} = s_t \sin X_o \cos \lambda_o$ where X_o is the angle between 0001 and the specimen axis and λ_o is the angle between the specimen axis and the direction of slip. Certain connections between the form of the extension curves and the external shape of the deformed specimens could be observed. Photographs of the extended specimens are reproduced. The tabulated values of t_{cr} determined under identical conditions on specimens cut from different crystals agree moderately well considering that the crystal orientation is not under control. The curves for t_{cr} as a function of T (temperature) for Zn are

Card2/4

SOV/70-3-1-10/26

The Dependence of the Critical Splitting Stress of Single Crystals of Zinc on Temperature and Rate of Deformation

significantly different to those for Cd. For Cd above 500 °C t_{cr} is independent of T but for Zn at the higher temperatures t_{cr} decreases faster and faster.

Bi shows the same type of behaviour as Cd. The influence of the superficial oxide layer and surface irregularities on the yield stress of the specimens of the low-melting-point metals studied by Schmidt and Boas, which were only 1 mm in diameter, may be considerable. Not only the limit of flow of these specimens may be influenced but also there may be some retardation on the formation of slip planes. All these effects can be reduced by using large-diameter specimens. Differences between the behaviour of the Zn and Cd may be due to oxide films and supplementary experiments are necessary to clarify the situation. The dependence of t_{cr} on velocity of deformation is substantially the same for Zn and Cd. There are 5 figures, 3 tables, and 3 references, 2 of which are Soviet and 1 English.

Card3/4

SOV/70-3-1-10/26

The Dependence of the Critical Splitting Stress of Single Crystals
of Zinc on Temperature and Rate of Deformation

ASSOCIATION: Institut kristallografii AN SSSR (Institute of
Crystallography of the Ac.Sc.USSR)

SUBMITTED: January 5, 1957

Card 4/4

SOV/70-3-1-11/26

AUTHORS: Perekalina, Z.B., Regel', V.R. and Dubov, G.A.

TITLE: Some Results of Compression Testing of Naphthalene Monocrystals (Nekotoryye rezul'taty ispytaniy monokristallov naftalina na szhatiye)

PERIODICAL: Kristallografiya, 1958, Vol 3, Nr 1, pp 71 - 79 (USSR)

ABSTRACT: Mechanical properties of naphthalene monocrystals are of practical interest because these monocrystals, with anthracene admixtures, are widely used as scintillators for recording of radioactive radiations. Detailed investigations of plasticity of naphthalene were carried out by Kochendörfer (Ref 2). In the majority of his tests, Kochendörfer applied shear stresses. The present paper extends Kochendörfer's work to compression stresses. Naphthalene samples were prepared in the form of rectangular rods of 6 x 6 x 15 or 6 x 6 x 20 mm dimensions, by cutting up a large monocrystal grown by the Kyropoulos method. The samples were polished by means of a cloth soaked in kerosene. They were cut with their longitudinal axes at various orientations to the crystallographic axes and the cleavage plane of the crystal. The orientation

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SOV/70-3-1-11/26

Some Results of Compression Testing of Naphthalene Monocrystals

of each sample was expressed in terms of an angle χ_0 between the sample axis and projection of this axis onto the plane of slip and the angle λ_0 between the sample axis and the direction of slip. Compression tests were carried out at room temperature using the apparatus described earlier (Refs 3, 4). In the majority of tests, the rate of deformation was ~ 0.17 mm/min. The rods were compressed to a certain degree of deformation and then held at constant deformation for 15 - 30 minutes in order to obtain the stress relaxation curves. Both the compression and the relaxation curves were recorded automatically by means of a device incorporating a microphotometer MF-4. The apparatus used made it possible to determine the applied force to within ± 20 g and the stresses were known to within ± 1 g/mm². The changes produced by compression could be seen in polarized light; the angles of mutual rotation of various regions of the crystal were deduced from the extinction angles.

Card2/5 To determine the orientation of a particular region of the

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Some Results of Compression Testing of Naphthalene Monocrystals

deformed sample with respect to the crystallographic directions of the original monocrystal, the authors used the fact that naphthalene splits along its cleavage plane when lightly wetted with a volatile solvent such as kerosene, dichlorethane or acetone. Cleavage cracks so produced show clearly the rotations of individual portions of the deformed sample. Over 50 samples of various orientations were tested. Figure 1, curves a-b, show the compression and relaxation and Figures 2-4 show photographs of samples in which the principal system of slip lines was expected ($\chi_0 = \lambda_0 = 15-75^\circ$). Curves c, d and e in Figure 1 show the compression and relaxation of samples with $\chi_0 = \lambda_0 = 0^\circ$, $\chi_0 = 45^\circ$, $\lambda_0 = 90^\circ$, $\chi_0 = 0^\circ$, $\lambda_0 = 90^\circ$, respectively; in these cases, the

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Some Results of Compression Testing of Naphthalene Monocrystals

principal system of slip cannot occur. Photographs of the latter group of samples are shown in Figures 5-7. Each curve of Figure 1 consists of two portions separated by a vertical dotted line. The lefthand curve shows the compression plotted as the degree of deformation (ϵ), in percent, against the stress (σ), in g/mm^2 . The righthand curve shows the relaxation plotted as stress (σ), in g/mm^2 , against time (t), in minutes. From the results obtained, the authors draw the following conclusions: 1) the compression curves have a jagged form because of formation of faults (regions of asymmetric reorientation). The presence of these faults was confirmed by observation in polarized light; 2) the rate of relaxation is high to start with, but it slows down rapidly with time. The relaxation is not accompanied by softening; 3) the flow limits of samples with different orientations varied between 15 and 360 g/mm^2 .

Acknowledgments are made to L.M. Belyayev and M.V. Klassen-Neklyudova for their advice.

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Some Results of Compression Testing of Naphthalene Monocrystals

There are 8 figures, 1 table, and 13 references, 6 of which are Soviet, 2 German, 4 English and 1 translation from English into Russian.

ASSOCIATION: Institut kristallografii AN SSSR
(Institute of Crystallography of the Ac.Sc.USSR)

SUBMITTED: January 5, 1957

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SOV/120-58-6-22/32

AUTHORS: Regel', V. R. and Dubov, G. A.

TITLE: Photoelectric Device for Measuring the Double Refraction
(Fotoelektricheskiy izmeritel' dvuprelomleniya)

PERIODICAL: Pribery i tekhnika eksperimenta, 1958, Nr 6, pp 102-104
(USSR)

ABSTRACT: The instrument is shown in the block schematic of Fig.1. In this, a beam of light derived from a small filamentary lamp (2.5 V, 0.8 A) passes through the condenser 2 and impinges on an inclined glass plate 4. The portion of light which is transmitted through the plate 4, is directed on to the polarizer 5, the investigated sample 7, the analyzer 8, which is crossed with the polarizer 5 and impinges on the measuring photo-element a. The portion of light which is reflected from the plate 4, passes through the optical wedge 10 and impinges on a potentiometer photo-element 11. Apart from the above, the optical system comprises a plate for producing an additional path difference and an optical spectro-neutral wedge 3. The system can

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Photoelectric Device for Measuring the Double Refraction

also be furnished with an interference light filter. If the instrument is fitted with selenium photo-elements, type SF-10, and a 2-watt light source and a galvanometer having a sensitivity of 10^{-9} A/mm/m, the path difference can be measured with an accuracy of $\pm 0.01 \mu\text{m}$; this accuracy is higher by about 2 orders than that obtainable with the standard potentiometers. The instrument was used to plot the graph of Fig.4. This shows a quantity σ which is proportional to the optical path difference Γ , produced in the transducer of a dynamometer. The curve was obtained by means of a compression test of a polycrystalline aluminium sample. The paper contains 4 figures and 2 Soviet references.

ASSOCIATION: Institut kristallografii AN SSSR (The Institute of Crystallography of the Academy of Sciences, USSR)

SUBMITTED: December 24, 1957.

Card 2/2

REGEL', V.R.; GOVORKOV, V.G.; DOBRZHANSKIY, G.F.

Effect of the temperature and the rate of deformation on the
parameters of tension curves for silver chloride single crystals.
Opt.-mekh. prom. 25 no.6:28-32 Je '58. (MIRA 11:10)
(Crystallography) (Silver chloride)

19(6)	20(7)	20(7)	20(7)
21(6)	22(6)	23(6)	24(6)
25(6)	26(6)	27(6)	28(6)
29(6)	30(6)	31(6)	32(6)
33(6)	34(6)	35(6)	36(6)
37(6)	38(6)	39(6)	40(6)
41(6)	42(6)	43(6)	44(6)
45(6)	46(6)	47(6)	48(6)
49(6)	50(6)	51(6)	52(6)
53(6)	54(6)	55(6)	56(6)
57(6)	58(6)	59(6)	60(6)
61(6)	62(6)	63(6)	64(6)
65(6)	66(6)	67(6)	68(6)
69(6)	70(6)	71(6)	72(6)
73(6)	74(6)	75(6)	76(6)
77(6)	78(6)	79(6)	80(6)
81(6)	82(6)	83(6)	84(6)
85(6)	86(6)	87(6)	88(6)
89(6)	90(6)	91(6)	92(6)
93(6)	94(6)	95(6)	96(6)
97(6)	98(6)	99(6)	100(6)
101(6)	102(6)	103(6)	104(6)
105(6)	106(6)	107(6)	108(6)
109(6)	110(6)	111(6)	112(6)
113(6)	114(6)	115(6)	116(6)
117(6)	118(6)	119(6)	120(6)
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133(6)	134(6)	135(6)	136(6)
137(6)	138(6)	139(6)	140(6)
141(6)	142(6)	143(6)	144(6)
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149(6)	150(6)	151(6)	152(6)
153(6)	154(6)	155(6)	156(6)
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161(6)	162(6)	163(6)	164(6)
165(6)	166(6)	167(6)	168(6)
169(6)	170(6)	171(6)	172(6)
173(6)	174(6)	175(6)	176(6)
177(6)	178(6)	179(6)	180(6)
181(6)	182(6)	183(6)	184(6)
185(6)	186(6)	187(6)	188(6)
189(6)	190(6)	191(6)	192(6)
193(6)	194(6)	195(6)	196(6)
197(6)	198(6)	199(6)	200(6)

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A005/A001

Translation from: Referativnyy zhurnal, Fizika, 1960, No. 8, p. 170, # 20053

AUTHORS: Regel', V.R., Berezhkova, G.V.

TITLE: The Influence of the Stress State Picture on the Parameters of the Yield Curves of Certain Plastics

PERIODICAL: V sb.: Nekotoryye probl. prochnosti tverdogo tela. Moscow-Leningrad, AN SSSR, 1959, pp. 375-384

TEXT: Polymethylmethacrylate¹ (I) with various plasticizer content was studied. The values of the limits of the forced elasticity σ_f compr obtained by compression tests do not depend on the ratio h/d of the specimen height to its diameter, when $h/d \gg 2$. Therefore, when determining σ_f compr, it is sufficient to examine specimens with $h/d = 2$. The ratio of the limits of the forced elasticity determined from compression- and extension tests $K = \sigma_f \text{ compr} / \sigma_f \text{ extens}$ is, as a rule, greater than unity. For I without plasticizer $K = 1.65$ at 25°C . The increase in plasticizer content leads to increase in K . The difference between $\sigma_f \text{ compr}$ and $\sigma_f \text{ extens}$ may be explained by the following causes: 1) the variation in the rearrangement conditions of the atoms and molecules in conse-

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The Influence of the Stress State Picture on the Parameters of the Yield Curves
of Certain Plastics

quence of the variation of distances between them under the effect of normal stresses; 2) the interaction of destruction processes (breaks of the individual chemical or Van-der Waals bonds the origination and growth of cavities and cracks) and the yield processes; 3) the thermal effects neglected in the examinations.

ASSOCIATION: In-t kristallogr. AN SSSR (Institute of Crystallography of AS USSR),
Moscow

From author's summary

Translator's remark: Subscripts f (forced), compr (compression), and extens (extension) are translations of the original v (vynuzh-denny), szhat (szhatiye), and rast (rastyazheniye)

Translator's note: This is the full translation of the original Russian abstract.

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SOV/70.4-2-15/36

AUTHORS: Regel, V.R. and Stepanova, V.M.

TITLE: Experiments on the Detection of Dislocations in Single Crystals of Zn by the Method of Etching (Opyty po vyyavleniyu dislokatsiy v monokristallakh Zn metodom travleniya)

PERIODICAL: Kristallografiya. 1959. Vol 4, Nr 2, pp 226 234 (USSR)

ABSTRACT: Experiments with single crystals of zinc illustrate the difficulties encountered in trying to apply the method of etching to show up dislocations in metals. The necessity of analysing the results of such experiments critically is underlined. Examples of the patterns produced on Zn by etching with weak reagents are adduced and, in particular, those produced by water. It is shown that certain weak etches influence defects on only freshly exposed cleavage planes. Numerous pictures which are observed as a result of the action of weak etches on Zn show that the task of exposing dislocations by this method is complicated not only for Zn but also for other metals. It is essential to confirm that the etch figures

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Experiments on the Detection of Dislocations in Single Crystals of Zn by the Method of Etching

are due to the emergence of dislocations and not to other defects. This is shown to be difficult. The figures obtained can be either pits or hillocks formed by deposits. Sometimes symmetrical figures can be obtained from epitaxial deposits. This work shows that the method can, however, be applied for exposing a series of surface defects, particularly surface relief after breaking. For this, it is necessary to make a more detailed study of the mechanism of action of weak etches and to determine on what defects, besides the places where dislocations emerge, etch figures can be preferentially formed. Experimental work of this type could help to found a theory of the etching of crystals by weak etchants. Acknowledgments are made to M.V. Klassen-Neklyudova and V.L. Indenbom. There are 7 figures, 1 table and 9 references, 1 of which is Soviet, 7 English and 1 international.

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Experiments on the Detection of Dislocations in Single Crystals of
Zn by the Method of Etching

ASSOCIATION: Institut kristallografii AN SSSR (Institute of
Crystallography of the Ac.Sc.USSR)

SUBMITTED: October 31, 1958

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SOV/70-4-5-22/36

AUTHORS: Regel', V. R., Berezhkova, G. V.

TITLE: Concerning the Dependence of Faulting Limits on the Crystallographic Orientation of Single Crystals.

PERIODICAL: Kristallografiya, 1959, Vol 4, Nr 5, pp 761-767 (USSR)

ABSTRACT: The mechanism of displacements as a result of plastic deformations has been studied by numerous scientists including the Soviet crystallographers Urusovskaya, A. A., Pereklina, Z. V., Dubov, G. A., Klassen-Neklyudova, M. V. and Regel', R. V. The term "faulting" is used instead of "kink-band formation" used by the American authors. The compression stress, σ_c , that causes the climb of glide planes, concentrates them and forms the first break along which a concentrated displacement takes place (and, consequently, the stress field becomes instantly relieved) is termed "faulting limit". It depends on the orientation of the crystal under test and has been considered an unequivocal

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Concerning the Dependence of Faulting
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function of the shear stress, τ_c , concerned, as defined in $\tau_c = \sigma_T \sin \chi \cos \lambda$, where σ_T is yield limit which actually coincides with the faulting limit of the authors; χ is the angle between the crystal axis and its projection on the slip plane; λ is the angle between the crystal axis and the slip direction. To prove or disprove the validity of the equation, the authors undertook numerous experiments with CsI and TlBr + TlI crystals, from which they cut off cylinders, 6 mm high, 3 mm in diameter and 5 mm high, 2 mm in diameter respectively, and annealed for 3 hours at 510°C and 280°C respectively. The angle α between the cylinder axis and $[110]$ of the crystal was determined with an accuracy of $\pm 10^\circ$. The χ and λ at varying α are compiled in the Table A.

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Concerning the Dependence of Faulting
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tion of Single Crystals.

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Table A

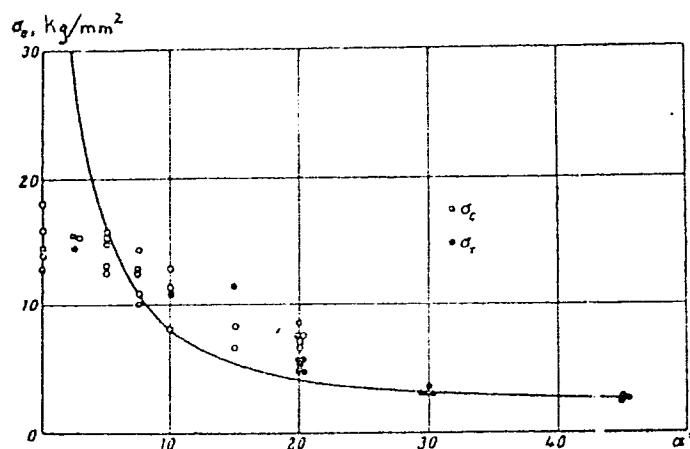
α		0	2,5	5	7,5	10	15	20	30	45
(110)	χ	0	1,8	3,5	5	7	10	14	20	30
[001]	λ	0	2,5	5	7,5	10	15	20	30	45
(101)	χ	45	44,8	44,5	44,2	44	43	41	38	30
[010]	λ	90	87,5	85	82,5	80	75	70	62	45

The swelled bands of the CsI cylinders, compressed along their axes having $\alpha \leq 20^\circ$, were always normal to [100] and the slip was parallel to [110]. The deviations from this were proved to occur when $\alpha > 20^\circ$ and to increase with increasing α until it reached 30° , above which no faulting took place. The TlBr + TlI cylinders showed deviations in wider limits and faulting even at $\alpha = 45^\circ$. The deviation of the experimental figure from the theoretical values (Fig. 5) indicates that the above equation is not strictly accurate.

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tion of Single Crystals.

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Fig. 5. The dependence of σ_c and σ_T on α in CsI

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The higher experimental values (dots above the curve) of σ_c are apparently related to the fact that faulting is preceded by slip along glide planes that increases the resistivity of the crystals. Selivanov, K. V. is acknowledged for assistance. There are 5 figures; 1 table; and 8 references, 5 Soviet, 3 U.S. The U.S. references are: Gilman, J. J., J. Metals, 6, 5, 621-629, 1954; Smakula, A., Klein, M., J. Chem. Phys., 21, 1, 100-104, 1953; Ballard, S. S., Combes, L. S., J. Opt. Soc. Amer., 43, 11, 975-976, 1953.

ASSOCIATION: Crystallographical Institute of the Academy of Sciences of the USSR (Institut kristallografii AN SSSR)

SUBMITTED: April 29, 1959

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24.7100

77112
SOV/70-4-6-13/31

AUTHORS: Regel', V. R., Govorkov, V. G.

TITLE: Concerning Plastic Deformation of Zinc Monocrystals
With Orientations Eliminating Basal Slip. I. Deforma-
tion Curves

PERIODICAL: Kristallografiya, 1959, Vol 4, Nr 6, pp 878-886 (USSR)

ABSTRACT: Variation of parameters of compression curves with the
change of temperature T and velocity of deformation
 v was studied in crystals in which the axis is either
parallel to the basal plane (χ = the angle formed
by the crystal axis with the basal plane $\approx 0^\circ$) or
perpendicular to it (λ = the angle between the
crystal axis and direction of slip $\approx 90^\circ$). Shearing
stress in the basal plane τ for both orientations
equals zero (since $\tau = \sigma \sin \chi \cos \lambda$, where σ =
applied normal stress). Compression curves of the
crystals, grown by the method of Obreimov-Shubnikov (in
glass tubes, covered by a thin layer of carbon black)
and prepared from pure Zn (99.98%) or from Zn + 0.1% Cd

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Monocrystals With Orientations Eliminat-
ing Basal Slip. I. Deformation Curves

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and Zn + 0.5% Cd mixtures were obtained using apparatus and methods described earlier [Dubov, G. A., Regel', V. R., Kristallografiya, 2, 6, 746-755, 1957; Regel', V. R., Berezhkova, G. V., Dubov, G. A., Zavodskaya Lab., 1, 101-105, 1959]. Results for the crystals with orientation $\chi \approx 0^\circ$ are illustrated in Figs. 1, 2, 3, and 5. Figures 3 and 5 show full agreement of compression data obtained by the authors with the empirical equation derived from the results of tensile tests by Gilman [Gilman, J. J., Plastic Anisotropy of Zinc Monocrystals, J. Metals, 8, 10, 1326-1336, 1956] for crystals with $\chi \approx 0^\circ$ (at the temperature above 250°C). The value for the activation energy Q (~ 45 kcal/mole for Zn + 0.1% Cd) found by the authors compares favorably with 46 kcal/mole found by Gilman and stays constant for Zn-Cd mixtures up to Cd content of 0.5%. Compression of crystals of the second series ($\chi \approx 90^\circ$) (see Fig. 6) does not follow Gilman's equation even in the narrow temperature range ($300-400^\circ\text{C}$) indicating

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Concerning Plastic Deformation of Zinc
Monocrystals With Orientations Eliminat-
ing Basal Slip. I. Deformation Curves

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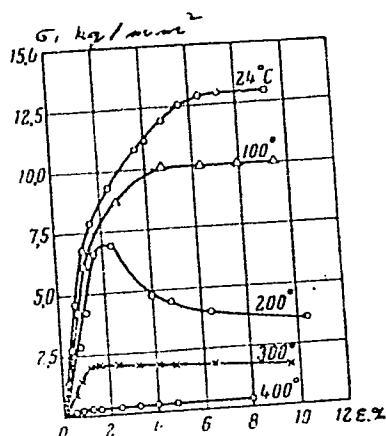


Fig. 1. Compression curves for Zn + 0.1% Cd monocrystals
at various temperatures ($\chi \approx 0^\circ$): σ , stress, kg/mm²;
 ϵ , compression, %.

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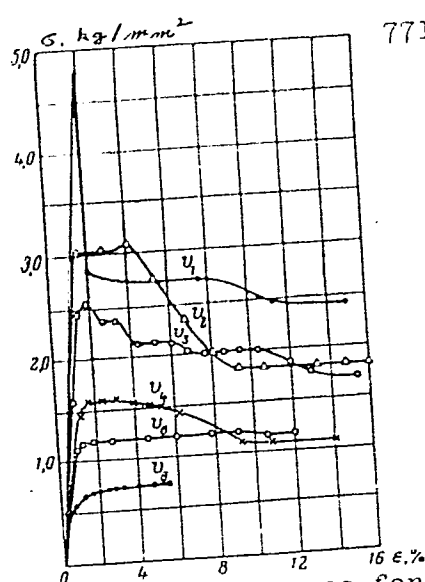


Fig. 2. Compression curves for Zn + 0.1% Cd monocrystals at various velocities of deformation ($\chi \approx 0^\circ$): σ , stress, kg/mm²; ϵ , compression, %; v_1 , 4.5; v_2 , 1.12; v_3 , $3.65 \cdot 10^{-1}$; v_4 , $11.25 \cdot 10^{-2}$; v_5 , $2.2 \cdot 10^{-2}$; v_6 , $2.2 \cdot 10^{-3}$ mm/min.

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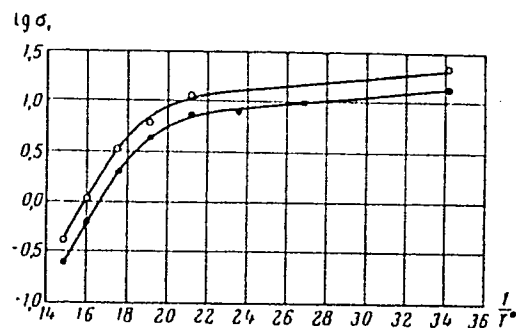


Fig. 3. Variation of yield limit with temperature
for Zn monocrystals. ●, Zn + 0.1% Cd; ○, Zn + 0.5% Cd
($\chi \approx 0^\circ$).

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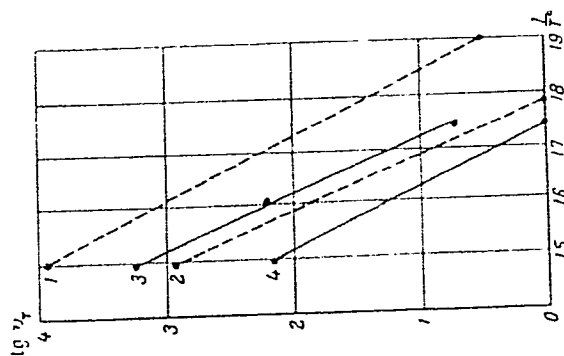
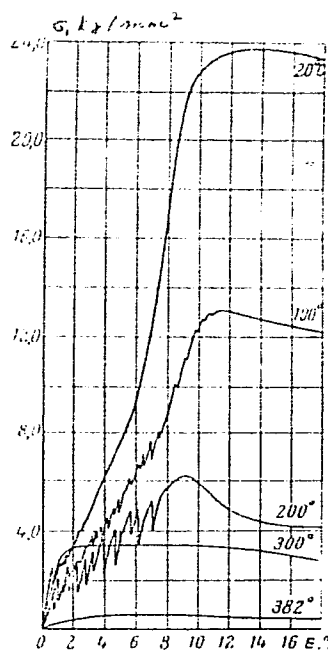


Fig. 5. Variation of $\log v_T$ with $1/T$ for Zn monocrystals ($\chi \approx 0^\circ$) at constant σ : (1) pure Zn, from the data of Gilman (reference is given in the text below); (2) Zn + 0.1% Cd, from the data of Gilman; (3) Zn + 0.1% Cd; (4) Zn + 0.5% Cd.

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Fig. 6. Compression curves for Zn monocrystals at various temperatures ($\lambda \approx 90^\circ$): σ , stress, kg/mm²; ϵ , compression, %.

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nonconstancy of Q (at the same time, the value of Q above 350°C for Zn crystals with $\lambda \approx 90^\circ$ is much higher than for the crystals with $\lambda \approx 0^\circ$). The greater value of deformation resistance found for crystals with $\lambda \approx 90^\circ$ at room temperature is explained by the fact that orientation $\lambda \approx 90^\circ$ eliminates not only basal slip but also slip in the prism plane, which takes place in crystals with $\lambda \approx 0^\circ$, and that deformation in the former takes place by twinning and faulting (slip in some other plane, e.g., pyramid plane, is also possible). The authors point out that there exists a relationship between the mechanism of deformation and the form of deformation curves (and the appearance of deformed sample). The zigzags on the deformation curves (below 300°) in Fig. 6, for example, indicate reorientation of individual regions of the crystal during twinning or faulting. However, detailed information of the deformation mechanism can be obtained only by metallographic study of dislocations (already started

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for the samples investigated in this work [Urusovskaya, A. A., Stepanova, V. M., Kristallographiya (in the process of printing)]. M. V. Klassen-Neklyudova participated in discussions on this study. There are 8 figures; 2 tables; and 10 references, 9 Soviet, 1 U.S. The U.S. reference is: Gilman, J. J., J. Metals, 8, 10, 1326-1336, 1956.

ASSOCIATION: Institute of Crystallography of the Academy of Sciences,
U. S. S. R. (Institut Kristallografii AN SSSR)

SUBMITTED: June 6, 1959

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SOV/120-59-4-32/50

AUTHORS: Regel', V. R., Govorkov, V. G.

TITLE: ~~XXXXXXXXXXXXXXXXXXXX~~ A Raster Recording Micrometer

PERIODICAL: Pribery i tekhnika eksperimenta, 1959, Nr 4, pp 133-136
(USSR)

ABSTRACT: The authors describe a raster recording micrometer which can be used to measure displacements of up to 10 mm with a precision of 0.1 μ . The action of a raster micrometer is based on photoelectric measurement of a light beam passing through a system of two rasters which can be moved with respect to one another. The instrument is shown schematically in Fig 1. A light beam from a small incandescent lamp 1 passes through a condenser lens 2, an optical grey wedge 3 and falls on an inclined glass plate 4. This glass plate acts as a beam splitter. Some of the light passes through two rasters 5 and 6 and reaches a measuring photo-element 7. The rest of the light passes through a second grey wedge 8 and reaches a compensation photo-element 9. By displacement of the wedge 3, it is possible to alter the initial light intensity I_0 of the beam reaching the plate 4. The compensation part of the system, which consists of the wedge 8 and the photo-element 9 is used to establish the zero position of the

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A Raster Recording Micrometer

galvanometer [1] when the rasters are exactly aligned. Each of the rasters is rigidly connected to one of the two points whose mutual displacement is to be measured. Fig 1 shows the instrument when it is used to measure deformation of a sample in creep tests. One of the rasters 5 is rigidly connected to the upper part of the sample 10, and the second raster 6 is attached to the lower part of the sample. Fig 2 is a photograph of the raster micrometer as used in micro-mechanical experiments (Fig 2a shows the micrometer as a whole and Fig 2b shows the micrometer without the optical system). The rasters should be as light as possible, especially when they are attached directly to a sample. This is particularly important in measurements of deformation of comparatively weak, brittle or plastic materials. The rasters were prepared by V. F. Parvov in A. V. Shubnikov's laboratory by photographing a system of white and black bands (the latter were painted with Indian ink). The bands were recorded either on a photographic plate or on a photographic film; the rasters made of films are lighter and more

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A Raster Recording Micrometer

suitable for micro-mechanical experiments. The raster dimensions were 15 x 15 mm and the widths of the white and black bands were the same ($d = 0.1$ mm). The sensitivity, ϕ , of a raster micrometer is given by the number of the galvanometer scale divisions n per unit displacement of the rasters; $\phi = dn/dx$. For ideal rasters the relationship between their mutual displacement and the photocurrent as recorded by the galvanometer should be linear for displacements smaller than the raster bandwidth d . Such a linear dependence of n on x for ideal rasters is shown in Fig 3a. In this case the micrometer sensitivity is constant and equal to $\phi = cI_0/d$, i.e. the sensitivity is proportional to I_0 , the intensity of the light beam incident on the plate 4 and it is inversely proportional to the raster bandwidth d . The coefficient of proportionality c depends on the sensitivity of the photo-elements and the galvanometer. In the micrometer constructed by the authors selenium photo-elements SF-10 of ~ 500 $\mu A/lumen$ sensitivity were used. The photocurrent was recorded by means of a galvanometer of 10^{-9} A/mm per metre sensitivity. To record the photocurrent the authors used the appropriate part of a microphotometer MF-4 (there

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A Raster Recording Micrometer

were 1000 divisions on the scale of the galvanometer used in MF-4). The sensitivity of the micrometer was then $\varphi = n_{\max}/d = 1000 \text{ divisions/mm}$, i.e. one scale division corresponded to a displacement of 0.1μ . This figure refers to the rasters in the fully open position (exact alignment) and the conditions when a 2W lamp was used and the grey wedge 3 was only partly inserted. Higher sensitivity could be obtained by removing the grey wedge 3 altogether. Still higher sensitivity could be obtained by replacing the photoelements by photomultipliers and using d.c. amplifiers. The above discussion of the micrometer sensitivity assumed that the rasters are ideal. For real rasters the relationship between the photocurrent n and the raster displacement x is not linear. Fig 36 shows schematically the dependence of n on x for real rasters. For real rasters we have a linear portion AB, where $(dn/dx)_{AB} = \text{const}$. The value of $(dn/dx)_{AB}$ for a real raster is higher than for an ideal

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BOV/120-59-4-32/50

A Raster Recording Micrometer

raster, i.e. the sensitivity of a micrometer with real rasters is higher in the AB region than that of a micrometer with ideal rasters. On the other hand, the sensitivity is much lower in the regions from 0 to A and from B to E where dn/dx is not constant. The interval Δ between B and E in Fig 3⁶ is exaggerated. Fig 4 shows the dependence of the photo-current on the raster displacement for a real micrometer shown in Fig 2; the graph was obtained by recording the photo-current by means of the appropriate part of a micro-photometer MF-4. Fig 4 shows that for this micrometer the value of Δ is $\sim 0.2d$. The raster micrometer of Fig 2 was tested in several experiments. Fig 4a shows the record of motion of the upper plunger of the micrometer displaced at a uniform rate with respect to the lower plunger. When the upper plunger was stopped the instrument recorded a straight line parallel to the abscissa axis (Fig 4⁶) which indicates that temperature variations in the room where the experiment was carried out do not produce unstable displacement of the rasters during periods of, say, 15 min. Fig 5 shows the record of creep of plasticized polymethylmethacrylate.

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A Raster Recording Micrometer

Fig 6 shows the record of creep of the same material but under the action of a smaller force. Acknowledgments are made to A. V. Shubnikov who suggested the subject and advised on it, and to V. F. Parvov for preparation of the rasters. There are 6 figures and 4 Soviet references.

ASSOCIATION: Institut kristallografii AN SSSR (Crystallography Institute, Academy of Sciences, USSR)

SUBMITTED: July 17, 1958.

Card 6/6

24.2000

77130
SOV/70-4-6-31/31

AUTHORS: Regel', V. R., Urusovskaya, A. A., Kolomiychuk, V. N.

TITLE: Revealing Dislocation Patterns on Crystal Surfaces by Means of Etching. A Review

PERIODICAL: Kristallografiya, 1959, Vol 4, Nr 6, pp 937-955 (USSR)

ABSTRACT: This is a review of Soviet and foreign literature covering the period 1944 to 1959 inclusive, and dealing with etch pit formations. Forty-five investigated metals, metal alloys, minerals, and chemical compounds are correlated in a table with the etching agents used in the studies, and with the corresponding reference sources. The following etching agents not mentioned in the foreign literature were used in the Soviet studies: for etching germanium crystals, $K_3 [Fe(CN)_6] + KOH$ [Ref 237]; for antimony, ionic bombardment [Ref 235, 236]; for cadmium, 2 pts. H_3PO_4 + 2 pts. glycerol + 2 pts. H_2O ;

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Revealing Dislocation Patterns on Crystal Surfaces 77130
by Means of Etching. A Review

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electrolytic etching with 0.9-1.0 v current for 20 to 40 sec [Ref 225]; for sylvine (KCl); butvar [Ref 262]; For LiF, 3% hydrogen peroxide [Ref 226]; For calcite (CaCO_3), hydrochloric acid in various concentrations [Ref 168]. The first Soviet studies on detection of dislocations by means of etching and decoration were published in 1957. It was shown [Ref 150] that the strains around the dislocations determined optically agreed with those predicted theoretically. G. B. Rays [Ref 168] investigated etch pits in calcite crystals and correlated them with the dislocations. Dislocation nets in silver chloride crystals were also investigated [Ref 180]. The formation and movements of dislocations in LiF crystals subjected to plastic deformation and under the action of high temperature were studied, and it was shown that the mobility of the screw dislocations was higher than that of the edge dislocations [Ref 226]. Deformed NaCl crystals were investigated optically and interferometrically by means of selective etching [Ref 261]. Symmetrical and spiral Frank-Read

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by Means of Etching. A Review

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sources were revealed on etching cadmium crystals containing 0.01% zinc, and cinematographic pictures of the etching of these sources were taken, showing their distribution in the crystal [Ref. 249]. Frank-Read sources were also revealed in cadmium crystals by means of ionic bombardment, in much higher number than by the etching method [Ref 249]. Studies on etching zinc crystals [Ref 251, 257] helped to explain the discrepancy in the results obtained by J. J. Gilman [J. Metalis, 1956, Vol 8, Nr 8, pp 998-1004] and A. H. Meleka [Philos. Mag., 1956, Vol 1, Nr 9, pp 803-811]. By acting on the crystal surface with an alcohol solution of iodine, the latter obtained not etch pits but growth patterns, arranged not so much on the dislocations as on the uneven spots of the surface. The effect of bismuth admixtures on the density of the dislocations in germanium crystals was investigated [Ref 237]. Selective etching was used in the studies

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Revealing Dislocation Patterns on Crystal Surfaces
by Means of Etching. A Review

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of the translational origin of irrational twins in NaCl and LiF [Ref 242] and birefringent bends in zinc [Ref 260]. Other Soviet and related references are listed in the attached card. There is 1 table; and 264 references, 108 U.S., 75 U.K., 10 French, 6 Dutch, 1 Italian, 22 Japanese, 11 German, 2 Polish, 2 Czechoslovakian, 2 Hungarian, and 25 Soviet. The most recent U.S. and U.K. references are: L. R. Low, R. W. Guard, Acta Metallurgica, 7, 3, 171-179, 1959; T. H. Schofield, A. E. Bacon, ibid., 7, 6, 403-406, 1959; L. C. Lovell, J. H. Wernick, J. Appl. Phys., 30, 5, 1959; A. S. Parasnis, J. W. Mitchell, Philos. Mag., 4, 38, 171-179, 1959; J. Silcox, P. H. Hirsch, ibid., 4, 37, 72-89, 1959. Soviet and Related References: 118. I. Auleytner, K. Godwood, I. Krilov, Bull. de l'Acad. Polon., 5, 6, 639-642, 1957; 150. V. L. Indenbom, G. E. Tomilovskiy, Dokl. AN SSSR, 115, 4, 723-726, 1957; 151. B. Jeszenszky, Acta Phys. Acad. Scient. Hungar., 8, 147-160, 1957; 168. G. B. Rays, Dokl. AN SSSR, 117, 3, 419-422, 1957; 174. S. Yu., Atomnaya energiya, 3, 7, 70-72, 1957; 180. M. P. Shaskol'skaya, Yu. Kh.

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4

Revealing Dislocation Patterns on Crystal Surfaces
by Means of Etching. A Review

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Metallurgy of Semiconductors (Travleniye kristallov
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Urusovskaya, Kristallografiya, 3, 1, 1958; 235. V. Ye.
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V. T. Alekseyeva, P. G. Yeliseyev, Fiz. tverdogo tela,
1, 8, 1304-1307, 1959; 242. V. L. Indenbom, A. A.
Urusovskaya, Kristallografiya, 4, 1, 85-92, 1959;

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Revealing Dislocation Patterns on Crystal Surfaces
by Means of Etching. A Review

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SOV/70-4-6-31/31

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257. V. M. Stepanova, A. A. Urusovskaya, Kristallografiya,

AS:

Card 6/7

SUE
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7(0), 15(9)

AUTHORS:

Regel', V. R., Berezhkova, G. V.,
Dubov, G. A.

SOV/32-25-1-37/51

TITLE:

A New Device for Micromechanical Tests and Its Application to the Investigation of the Mechanical Properties of Polymers (Novyy pribor dlya mikromekhanicheskikh ispytaniy i yego primeneniye dlya issledovaniya mekhanicheskikh svoystv polimerov)

PERIODICAL:

Zavodskaya Laboratoriya, 1959, Vol 25, Nr 1, pp 101-105 (USSR)

ABSTRACT:

Devices for testing small samples must comply with special requirements as to rigidity and sensitivity. The most commonly used devices, the Soviet VIAM and that designed by Shovenar (Ref 1) show many defects so that they must be improved. A new recorder for micromechanical tests was designed by the Institut kristallografii Akademii nauk SSSR (Institute of Crystallography of the Academy of Sciences USSR) and the kafedra kristallofiziki fizicheskogo fakul'teta MGU (Chair of Crystal Physics of the Faculty of Physics of the Moscow State University). It is based on the application of a photoelectric optical dynamometer (Ref 2). Extension and compression curves as well as relaxation curves of stresses

Card 1/3

A New Device for Micromechanical Tests and Its
Application to the Investigation of the Mechanical
Properties of Polymers

SOV/32-25-1-37/51

and creep curves can be plotted by means of this new device. The first design variant of the device has been already described (Ref 3). In the present case, an improved design is described which was shown at the Industrial Exhibition of 1957 and 1958 as well as at the Brussels World Exhibition. The kinematic scheme of the device permits an axial pressure load (Fig 1). Selenium photocells of the SF-10 type were used in the dynamometer. For recording the photocurrent various commercial self-recorders of the type of Kurnakov's pyrometer, EPP-09, PS-383, MF-4, and others can be used. Various plastics, monocrystalline (Refs 5-7), polycrystalline and high-molecular substances (Refs 7,8) were tested. The reproducibility was tested with homogeneous polymethyl methacrylate (I). Furthermore, tests were carried out with (I) at various softener contents (dibutyl phthalate), as well as with the lattice-like (prostranstvenno sshitii) polymer-escapon. In this connection, observations were made which are important to the technology of production. The observations are described. There are 7 figures and 8 Soviet references.

Card 2/3

A New Device for Micromechanical Tests and Its
Application to the Investigation of the Mechanical
Properties of Polymers

SOV/32-25-1-37/51

ASSOCIATION: Institut kristallografii Akademii nauk SSSR (Institute of
Crystallography of the Academy of Sciences USSR)

Card 3/3

REGEL, VR

8 ~

PHASE I BOOK EXPLOITATION SOV/4609

Akademiya nauk SSSR. Institut nauchnoy informatsii

Nekotoryye voprosy fiziki plastichnosti kristallov (Some Problems in the Physics of the Plasticity of Crystals) Moscow, 1960. 209 p. (Series: Itogi nauki: Fiziko-matematicheskiye nauki, 3) 2,700 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Vsesoyuznyy institut nauchno-tekhnicheskoy informatsii.

Resp. Ed.: M. V. Klassen-Neklyudova; Ed. of Publishing House: Ye. B. Kuznetsova; Tech. Ed.: S. G. Tikhomirova.

PURPOSE: This book is intended for physicists, metallurgists, and persons interested in crystallography and solid state physics.

COVERAGE: These 6 articles were compiled by personnel of the Laboratoriya mekhanicheskikh svoystv kristallov Instituta kristallografii AN SSSR (Laboratory of Mechanical Properties of Crystals of the Institute for
Card 1/3

Some Problems in the Physics (Cont.)

SOV/4609

Crystallography AS USSR) to give a systematic account of the present state of studies in the strength and plasticity of crystals. The introductory article reviews the history of Soviet progress in developing theories of the mechanical properties of crystals, mainly single crystals. Names of leading Soviet and non-Soviet specialists in this field are mentioned. The articles discuss plastic properties of a single-crystal grain (crystallite). Fundamental data on the incomplete (block) structure of single crystals and polycrystalline grains, and on the structure and properties of interfaces between the grains of crystal groups [i.e., grain boundaries] are also reviewed. References accompany the articles.

TABLE OF CONTENTS:

Klassen-Neklyudova, M. V. Physical Principles of the Plasticity and Strength of Crystals. Moscow, 1958	5
Regel', V. R. Temperature and Time Dependence of the Plasticity Characteristic of Single Crystals	12
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Some Problems in the Physics (Cont.) SOV/4609

Urusovskaya, A. A. Plastic Deformation Not Accompanied
by Asterism in the Laue Diffraction Pattern 67

Urusovskaya, A. A. Formation of Sections With Re-
oriented Crystal Lattice During Deformation of Single and
Polycrystals 75

Indenbom, V. L. A Dislocational Description of Simple
Plastic Deformation Phenomena 117

Miuskov, V. F. Modern Theories on the Structure and
Properties of Intercrystal [Grain] Boundaries 159

AVAILABLE: Library of Congress

Card 3/3

JA/rn/ec
1-4-61

S/120/60/000/01/044/051

AUTHORS: Govorkov, V.G., Zakatov, A.F. and Regal', V.R.

TITLE: A Recording Equipment for the Photographic Measurement
of Low Currents 1

PERIODICAL: Pribory i tekhnika eksperimenta, 1960, Nr 1,
pp 138 - 139 (USSR)

ABSTRACT: The recording equipment, type ZU-1, for the measurement
of currents in the range 10^{-9} to 10^{-6} A was developed
and constructed at the Institute of Crystallography of
the Ac.Sc., USSR. The operation of ZU-1 is based on the
principle of photo-electric measurement of the light
reflected from the mirror of a galvanometer. The optical
system of the device is illustrated in Figure 3; this
consists of: 1- a light source; 2 - a condenser lens;
3 - a calibrated scale; 4 - an objective lens;
5 - a galvanometer mirror; 6 - a prism; 7 - a
photographic plate; 8 - a correcting lens; 9 - a
mirror; 10 - a screen; 11 - a slot; 12 - a
diaphragm; 13 - a cylindrical lens. The intensity of
the light falling onto the photo-sensitive layer is

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E192/E382

A Recording Equipment for the Photographic Measurement of Low Currents

controlled either by changing the diaphragm or by means of an auto-transformer. The equipment is used for the recording of the photo-currents produced by double refraction (Ref 2), photo-electric-optical dynamometer (Refs 1, 4) and other purposes. The authors thank I.N. Zhokhov and I.N. Tsigler for participation in the development of the equipment.

There are 3 figures and 4 Soviet references.

ASSOCIATION: Institut kristallografii AN SSSR (Institute of Crystallography of the Ac.Sc., USSR)

SUBMITTED: January 8, 1959



Card 2/2

REGEL', V.R.; GOVORKOV, V.G.; ZAKATOV, A.F.

Apparatus for mechanical tests of refractory materials. Zav.lab.
26 no.2:243-245 '60. (MIRA 13:5)

1. Institut kristallografii Akademii nauk SSSR.
(Refractory materials--Testing)

STEPANOVA, V.M.; POKROVSKIY, V.V., REGEL', V.R.

Exposing dislocations in rolled plates of silver chloride by
etching. Kristallografiia 5 no.1:108-114 Ja-P '60. (MIRA 13:7)

1. Institut kristallografi AN SSSR.
(Silver chloride)

S/161/61/003/005/003/042
B101/B214

24. 7500 (1160, 1402, 1132)

AUTHORS: Govorkov, V. G. and Regal', V. R.

TITLE: Dependence of the parameters of the compression curves of single crystals of germanium on temperature and rate of deformation

PERIODICAL: Fizika tverdogo tela, v. 5, no. 5, 1961, 1324-1330

TEXT: Up to now the plasticity of germanium has been tested predominantly for shearing and stress. The object of the present work was to supplement these data by testing for compression at different temperatures and rates of deformation v . Samples of the form of parallelepiped $5 \times 2 \times 2$ mm are cut out from single crystals of germanium with principal axes along $\langle 111 \rangle$, $\langle 110 \rangle$, and $\langle 100 \rangle$. The experimental apparatus is described in Ref. 15: V. R. Regal', V. G. Govorkov, A. F. Zakatov. Zav. lab., 26, no. 2, 243-245, 1960. Before the experiment the samples were heated for 1 hr at the temperature of the experiment. The tests were made in oxygen-free dry argon at 20-900°C. The rate v of relative deformation was varied between 10^{-2} - $2.4 \cdot 10^{-6}$ sec $^{-1}$. Fig. 2 gives the results for $v = 0.5 \cdot 10^{-4}$ sec $^{-1}$. Below 400°C brittle

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B101/B214

Dependence of the parameters

destruction set in without prior deformation. Between 400-700°C the curves show a "peak of fluidity". The results depend only slightly on the orientation of the samples. The following experiments were, therefore, carried out only with samples oriented towards σ_{11} and at temperatures 500, 600, and 700°C (Fig. 4). Results are found which differ considerably from those of V. R. Patel, B. H. Alexander (Acta Metallurg., 4, no. 4, 385-395, 1956). These authors found no "peak of fluidity". Graphical determination of the functions $\ln v = f(\sigma)$; $\ln v = f(\ln \sigma)$; $\ln v = F(1/T)$ showed that the following equation holds for the experimental data: $v = B\sigma^n \exp(-Q/T)$ (2). The activation energy ($Q = 47$ kcal/mole) calculated by this formula agrees with the values found from the shearing. As is shown by Fig. 6, the peak of fluidity is not reproducible if the compression is repeated after release, or if new loading is done at lower temperature. The peak is explained as due to the aggravation of the deformation whose origin remains still obscure. The irreversibility of the effect could be caused by small diffusion coefficients and low concentration of the impurities. M. V. Klassen-Neklyudov is thanked for advice and discussion. There are 6 figures, 1 table, and 16 references: 2 Soviet-bloc and 14 non-Soviet-bloc. The 2 most important references to English-language publications read as follows: J. Hornstra, Card 2/7

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S/181/61/003/005/003/042
B101/B214

Dependence of the parameters ...

J. Phys. a. Chem. Sol., 5, no. 1/2; 126-141, 1958; D. Dew-Hughes, G. E. Brock, J. Appl. Phys., 30, no. 12; 2020-2021, 1959.

ASSOCIATION: Institut kristallografi AN SSSR, Moskva (Institute of Crystallography AS USSR, Moscow)

SUBMITTED: November 25, 1960

Fig. 2: Compression curve of single crystals of germanium at different temperatures with relative rate of deformation $v = 6.3 \cdot 10^{-4} \text{ cm}^{-1}$.
Legend: a) orientation $\langle 111 \rangle$; () $\langle 110 \rangle$; δ $\langle 100 \rangle$.

Card 3/7

REGEL', V.R., MUINOV, T.M., POZDNYAKOV, O.F.

Application of mass spectrometry to investigate the mechanical
destruction of polymers.

Report presented at the 13th Conference on High-molecular compounds.
Moscow, 8-11 Oct 62

LEKSOVSKIY, A.M., REGEL', V.R.

Study of static and dynamic fatigue polymers.

Report presented at the 13th Conference on High-molecular Compounds.
Moscow, 8-11 Oct 62

VERSHININA, M.P., PEGEL', V.R., CHERNYI, N.N.,

Effect of UV radiation on the kinetics of flow and destruction
of caprone fibers.

Report presented at the 13th Conference on high-molecular compounds
Moscow, 8-11 Oct 62

5/181/62/004/004/016/042
B104/B108

AUTHORS: Regel', V. R., and Leksovskiy, A. K.

TITLE: Time dependence of strength under static and cyclic loading

PERIODICAL: Fizika tverdogo tela, v. 4, no. 4, 1962, 949 - 955

TEXT: A device designed for both static and cyclic tensile testing is described. It features a damper of the undesired harmonic oscillations arising under cyclic loading. Tests were made on Al and Zn metal foils, polymethyl methacrylate films, as well as caprone, viscose, and polyacrylonitrile fibers. The times t_0 until the materials broke under static and cyclic loading were determined. Under either load the relation $\log t_0 = f(\sigma)$ is linear within the error limits and converges to $t_0 \approx 10^{-2}$ sec. Appreciable divergences occur with great numbers of cycles only. The time dependence of strength under cyclic loading is regarded as a special case of the general temperature and time dependence of strength in solids. The mentioned divergence is explained by the varying behavior of a structural factor in the case of static and cyclic loading. S. N. Zhurkov, Corre-

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Time dependence of strength under ...

S/181/62/004/004/016/042
B104/B108

sponding Member AS USSR, is thanked for having posed the problem and for discussions. There are 3 figures.

ASSOCIATION: Fiziko-tekhnicheskiy institut im. A. F. Ioffe AN SSSR,
Leningrad (Physicotechnical Institute imeni A. F. Ioffe
AS USSR, Leningrad)

SUBMITTED: November 27, 1961

Card 2/2

S/190/63/005/002/017/024
B101/B102

AUTHORS: Regel', V. R., Ting Shu Shen
TITLE: Causes of stress recessions in stress-strain curves of vitreous polymers
PERIODICAL: Vysokomolekulyarnyye soyedineniya, v. 5, no. 2, 1963, 258-264
TEXT: The stress-strain curves were plotted for polymethyl methacrylate containing 30% dibutyl phthalate at room temperature and a deformation rate of $3.75 \cdot 10^{-3}$ mm/sec. In the first test the curve had a maximum σ_{max} and then fell to a stable value σ_{rec} . After annealing of the sample at 110°C , σ_{max} was much lower when the test was repeated. Further repetitions of annealing and test changed only $E = (d\sigma/d\epsilon)_{\epsilon=0}$ and σ_{max} , while σ_{rec} remained unchanged. After 15 tests, σ_{rec} increased. The recession cannot be explained by geometric or thermal effects. A restructuring is
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S/190/63/005/002/017/024
B101/B102

Causes of stress recessions ...

assumed to take place already in the first deformation. It is reversible when the specimen is kept for more than 300 hrs at room temperature. When the relative height h of σ_{\max} is defined as $h = (\sigma_{\max} - \sigma_{\text{res}}) / \sigma_{\max}$, the restoration θ is expressed by: $\theta = h(t) / h_{\text{init}}$, where t is the time of rest. There are 2 figures. ✓

-ASSOCIATION: Fiziko-tekhnicheskii institut AN SSSR (Physicotechnical Institute AS USSR)

SUBMITTED: September 6, 1961

L 12851-63

EWP(j)/EPF(c)/EWT(m)/BDS/ES(v) AFTTC/ASD Pc-l/Pr-l/

Pe-l RM/WW

ACCESSION NR: AP3001168

S/0190/63/005/006/0925/0931

1/
70

AUTHOR: Regel', V. R.; Cherny'y, N. N.

TITLE: Effect of ultraviolet irradiation on the kinetics of creep and breakdown of capron fibers

SOURCE: Vy*sokomolekulyarny*ye soyedineniya, v. 5, no. 6, 1963, 925-931

TOPIC TAGS: ultraviolet irradiation, kinetics of flow, breakdown of fibers, capron fibers, creep rate of fibers, polymer creep, elastic deformation

ABSTRACT: The present investigation was aimed at finding out whether a relationship existed between the rate of polymer deformation and polymer destruction, the yardstick for the former being its "set creep" rate. Capron threads, consisting of 80 monofibers of 20 Micron diameter, were subjected to stretching by means of various loads, with and without irradiation by ultraviolet light. The measurements consisted in determining the longevity of the samples (breaking point) as well as registering the rate of their "set creep." It was found that the product of these two values remains constant. It is concluded that the change in the "set creep" rate of oriented capron fibers is caused by a change in the destruction rate of the chemical bonds. The authors thank Zhurkov, S. N. for his continuous interest in

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this work and for valuable remarks in the discussion of results. Orig. art. has:
5 figures and 1 table.

ASSOCIATION: Fiziko-tekhnicheskiy institut AN SSSR (Physical-Technical Institute,
Academy of Sciences SSSR)

SUBMITTED: 26Dec61

DATE ACQ: 01Jul63

ENCL: 01

SUB CODE: 00

NO REF SOV: 017

OTHER: 000

Card 2/2

54000

S/181/62/004/009/020/045
B104/B186

AUTHORS: Regel', V. R., Muinov, T. M., and Pozdnyakov, O. F.

TITLE: Use of mass spectrometry for investigating the mechanical destruction of polymers

PERIODICAL: Fizika tverdogo tela, v. 4, no. 9, 1962, 2468 - 2473

TEXT: The attachment (Fig. 1) of a mass spectrometer was used to investigate the composition of the volatile products resulting from the mechanical destruction of polymethylmethacrylate (PM) and polystyrene (PS). The samples (cross-sectional area 1 - 2 mm²) were either compact or made up of thin film layers. The mass spectra obtained were analyzed by previous calibration of the spectrometer with H₂, He, H₂O, N₂, O₂, Ne, Ar, Kr, and Xe. Variations of the peaks were recorded by cinematography immediately before, during, and after the fracture of the sample. Volatile products resulting from mechanical and thermal destruction were found to have the same composition as each other. The fact that breaking PM and methyl- ✓B

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methacrylate have the same mass spectra indicates that monomer molecules separate from the breaking polymer. Breaking PS and styrene have different mass spectra. In addition to the peaks of styrene, it contains a great number of other peaks. Apart from the monomer, also other volatile products evolve. There are 3 figures and 1 table. /B

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GOVORKOV, V.G.; REGEL', V.R.; GLAZUNOV, V.N.

Apparatus for creep testing at high temperatures in a vacuum
or in an inert medium. Zav.lab. 29 no.3:376-378 '63.

(MIRA 16:2)

1. Institut kristallografii AN SSSR.
(Testing machines)
(Deformations (Mechanics))

ACCESSION NR: APL030351

S/0190/64/006/003/0395/0399

AUTHOR: Regel', V. R.

TITLE: Mechanical models of polymers, including breakdown elements

SOURCE: Vyssokomolekulyarnyye soyedineniya, v. 6, no. 3, 1964, 395-399

TOPIC TAGS: plastic flow, mechanical modeling, polymer deformation, Maxwell model, elasticity measurement, polymer stress, elastic deformation, plastic deformation

ABSTRACT: The author argued for incorporation of breakdown elements in rheological models of polymers in order to simulate breakdown processes occurring with polymer deformation. The breakdown element was pictured as a pair of parallel disks joined by several tension filaments. Each filament rupture corresponds to an analogous breakdown process in the deformation of a polymer solid (see Fig. 1 on the Enclosure). The following mathematical model of a breakdown element was formulated

$$\frac{de}{dt} = \frac{1}{E} \frac{d\sigma}{dt} + \frac{\sigma}{\eta} \left[\theta(e_1 - e) + \sum_{i=1}^N \theta(e - e_i) \cdot \theta(e_{i+1} - e) \cdot \theta(\sigma - \sigma_i) \right]$$

In the formula ϵ is strain, σ is tensile stress, t is time, E is the elasticity

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modulus, η is viscosity, σ_1 is the strength of the i^{th} filament and ϵ_i is the corresponding filament deformation when the i^{th} filament comes into tension, N represents the number of filaments in the breakdown element, and θ is a function which is unity when the breakdown element is in tension and zero otherwise. Several series and parallel configurations of breakdown elements used with conventional mechanical elements are presented. Orig. art. has: 3 figures and 1 equation.

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